What is claimed is:

1. A charged-particle-beam (CPB) microlithography system, comprising:

a CPB optical system situated and configured to irradiate a charged particle beam onto an exposure-sensitive surface of a lithographic substrate so as to transfer and imprint a resolved pattern on the exposure-sensitive surface; and

a first robotic manipulator situated relative to the CPB optical system and configured for conveying an object relative to the CPB optical system, the first robotic manipulator comprising at least one moving member that moves, during actuation of the manipulator, relative to the CPB optical system, the at least one moving member being substantially non-magnetic, having a relative magnetic permeability of 1.0005 or less.

2. The CPB microlithography system of claim 1, wherein the first robotic manipulator is configured to convey a reticle to a reticle stage for exposure and from the reticle stage after exposure.

3. The CPB microlithography system of claim 1, wherein the first robotic manipulator is configured to convey a lithographic substrate to a substrate stage for exposure and from the substrate stage after exposure.

4. The CPB microlithography system of claim 1, wherein:

the first robotic manipulator comprises multiple moving members including a first arm member and an object-holding member pivotably attached to the first arm member, the object-holding member being configured for holding the object as the first robotic manipulator moves the object in a vicinity of a magnetic field produced by the CPB optical system; and

the first arm member and the holding member are each made of a substantially non-magnetic material.

5. The CPB microlithography system of claim 4, wherein the substantially non-magnetic material is selected from the group consisting of Ti, SiC, and other materials having a relative magnetic permeability of 1.0005 or less.

6. The CPB microlithography system of claim 4, wherein:

the moving members of the first robotic manipulator further comprise a first shaft pivotably coupling the object-holding member to the first arm member; and

the first shaft is made of a substantially non-magnetic material.

7. The CPB microlithography system of claim 6, wherein:

the moving members of the first robotic manipulator further comprise a second arm member and a second shaft connecting the first and second arm members together in a manner allowing the first arm member to pivot about the second shaft relative to the second arm member in response to actuation of the first robotic manipulator; and

the second arm member and second shaft are each made of a substantially non-magnetic material.

8. The CPB microlithography system of claim 4, wherein:

the moving members of the first robotic manipulator further comprise a second arm member and a shaft connecting the first and second arm members together in a manner allowing the first arm member to pivot about the shaft relative to the second arm member in response to actuation of the first robotic manipulator; and

the second arm member and shaft are each made of a substantially non-magnetic material.

9. The CPB microlithography system of claim 1, wherein:

the CPB optical system is contained inside a vacuum process chamber to which is connected a load chamber; and

the first robotic manipulator is configured, when actuated, to move the object from the load chamber to the vacuum process chamber and from the vacuum process chamber to the load chamber.

10. The CPB microlithography system of claim 1, wherein:

the CPB optical system is contained inside a vacuum process chamber to which is connected a load chamber and a load-lock chamber; and

the first robotic manipulator is configured to move, when actuated, the object from the load-lock chamber to the load chamber, from the load chamber to the vacuum process chamber, from the vacuum process chamber to the load chamber, and from the load chamber to the load-lock chamber.

11. The CPB microlithography system of claim 10, wherein the first robotic manipulator is located inside the load chamber.

12. The CPB microlithography system of claim 10, wherein:

the vacuum process chamber comprises an optical column containing an illumination-optical system and a reticle stage; and

the first robotic manipulator is configured to move, when actuated, a reticle relative to the illumination-optical system, the movement being from the load-lock chamber to the load chamber, from the load chamber to the reticle stage, from the reticle stage to the load chamber, and from the load chamber to the load-lock chamber.

13. The CPB microlithography system of claim 12, further comprising a second robotic manipulator situated and configured to move, when actuated, the reticle relative to the illumination-optical system, the movement being from an external

environment to the load-lock chamber and from the load-lock chamber to the external environment.

14. The CPB microlithography system of claim 13, wherein;

the second robotic manipulator comprises at least one moving member that moves, during actuation of the second robotic manipulator, relative to the illumination-optical system; and

the at least one moving member is substantially non-magnetic.

15. The CPB microlithography system of claim 10, wherein:

the vacuum chamber comprises a wafer chamber containing a projection-optical system and a substrate stage; and

the first robotic manipulator is configured to move, when actuated, a lithographic substrate relative to the projection-optical system, the movement being from the load-lock chamber to the load chamber, from the load chamber to the substrate stage, from the substrate stage to the load chamber, and from the load chamber to the load-lock chamber.

16. The CPB microlithography system of claim 15, further comprising a second robotic manipulator situated and configured to move, when actuated, the substrate relative to the projection-optical system, the movement being from an external environment to the load-lock chamber, and from the load-lock chamber to the external environment.

17. The CPB microlithography system of claim 16, wherein;

the second robotic manipulator comprises at least one moving member that moves, during actuation of the second robotic manipulator, relative to the projection-optical system; and

the at least one moving member is substantially non-magnetic.

18. The CPB microlithography system of claim 15, further comprising a second robotic manipulator, wherein

the vacuum process chamber further comprises an optical column containing an illumination-optical system and a reticle stage, to which optical column are connected a second load chamber and a second load-lock chamber; and

the second robotic manipulator is configured to move, when actuated, a reticle relative to the illumination-optical system, the movement being from the second load-lock chamber to the second load chamber, from the second load chamber to the reticle stage, from the reticle stage to the second load chamber, and from the second load chamber to the second load-lock chamber.

19. A charged-particle-beam (CPB) microlithography system, comprising:

a first vacuum process chamber;

an illumination-optical system and reticle stage situated inside the first vacuum process chamber;

a first load chamber connected to the first vacuum process chamber;

a first robotic manipulator situated and configured to move, when actuated, a reticle relative to the illumination-optical system, the movement including from the first load chamber to the reticle stage in the first vacuum process chamber, and from the reticle stage to the first load chamber, the first robotic manipulator comprising moving members that are substantially non-magnetic, having a relative magnetic permeability of 1.0005 or less;

a second vacuum process chamber;

a projection-optical system and substrate stage situated inside the second vacuum process chamber;

a second load chamber connected to the second vacuum process chamber; and

a second robotic manipulator situated and configured to move, when actuated, a substrate relative to the projection-optical system, the movement including from the second load chamber to the substrate stage in the second vacuum process chamber, and from the substrate stage to the second load chamber, the second robotic manipulator comprising moving members that are substantially non-magnetic, having a relative magnetic permeability of 1.0005 or less.

20. The CPB microlithography system of claim 19, wherein the respective moving members of the first and second robotic manipulators are made of a material selected from the group consisting of Ti, SiC, and other materials having a relative magnetic permeability of 1.0005 or less.

21. The CPB microlithography system of claim 19, further comprising a first load-lock chamber connected to the first load chamber, and a second load-lock chamber connected to the second load chamber, wherein the first robotic manipulator is further configured to move, when actuated, the reticle from the first load-lock chamber to the first load chamber and from the first load chamber to the first load-lock chamber; and the second robotic manipulator is further configured to move the substrate from the second load-lock chamber to the second load chamber and from the second load chamber to the second load-lock chamber.

22. The CPB microlithography system of claim 21, wherein:
the first robotic manipulator is located in the first load chamber; and
the second robotic manipulator is located in the second load chamber.

23. The CPB optical system of claim 20, further comprising:

a third robotic manipulator situated and configured to move, when actuated, the reticle from an external environment to inside the first load-lock chamber and from the first load-lock chamber to the external environment; and

a fourth robotic manipulator situated and configured to move, when actuated, the substrate from the external environment to inside the second load-lock chamber and from the second load-lock chamber to the external environment, wherein the third and fourth robotic manipulators each comprise respective moving members that are substantially non-magnetic, having relative magnetic permeabilities of 1.0005 or less.

24. The CPB optical system of claim 23, wherein the respective moving members of the third and fourth robotic manipulators are made of a material selected from the group consisting of Ti, SiC, and other materials having a relative magnetic permeability of 1.0005 or less.

25. The CPB optical system of claim 24, wherein the respective moving members of the first and second robotic manipulators are made of a material selected from the group consisting of Ti, SiC, and other materials having a relative magnetic permeability of 1.0005 or less.

26. In a charged-particle-beam (CPB) microlithography method in which a charged particle beam is directed through a CPB optical system that produces a beam-controlling magnetic field so as to imprint a pattern on an exposure-sensitive surface of a lithographic substrate, a method for conveying an object relative to the CPB optical system without causing a significant perturbation of the beam-controlling magnetic field, the method comprising:

placing the object on a moving member of a robotic manipulator situated relative to the CPB optical system and configured for conveying an object relative to the

CPB optical system, the moving member being substantially non-magnetic, having a relative magnetic permeability of 1.0005 or less; and

actuating the robotic manipulator so as to move the object relative to the CPB optical system.

27. The method of claim 26, wherein:

the object is a reticle;

the CPB optical system comprises an illumination-optical system; and

actuation of the robotic manipulator also moves the reticle relative to the illumination-optical system.

28. The method of claim 27, wherein actuation of the robotic manipulator also places the reticle on a reticle stage of the illumination-optical system and removes the reticle from the reticle stage.

29. The method of claim 26, wherein:

the object is a substrate;

the CPB optical system comprises a projection-optical system; and

actuation of the robotic manipulator also moves the substrate relative to the projection-optical system.

30. The method of claim 29, wherein actuation of the robotic manipulator also places the substrate on a substrate stage of the projection-optical system and removes the substrate from the substrate stage.

31. The method of claim 26, wherein the step of actuating the robotic manipulator occurs while performing a lithographic exposure.